CENPP-PL-CH

Jim Britton
(ext. 6463)

RESULTS OF 1989 COOS BAY EMPIRE TURNING BASIN SEDIMENT QUALITY EVALUATION

1. At the request of CENPP-OP-NW sediment samples were taken in May 1989 in order to evaluate the repositioning of the Empire Turning Basin in Coos Bay from Coos River mile 5.5 to 5.7. The Oregon International Port of Coos Bay wanted to move the turning basin upstream. Following the CENPP TIER I and II Sediment Evaluation Testing approach, 5 sediment samples were taken by box core in the area. One just upstream (RM 6.0) and one downstream (RM 5.0) from the proposed project and three just west and east of the channel in areas where the repositioned turning basin would be located (see attachment 1). Physical analysis was run on samples CB-5, CB-5A,B &C and CB-6 while chemistry was run on CB-5C only. Physical analysis consisted of the usual Dredge Test Anlyses run by USACE-NPD Materials Lab. Chemical analysis included measurements of heavy metals, oil and grease, ammonia, TOC, pesticides and PCBs, PAH, phenols and dioxin/furans.

2. Physical and chemical analyses were performed to determine if the sediments met the exclusion criteria of the Ocean Dumping Act and Section 404 of the Clean Water Act for unconfined in-water disposal.

RESULTS/CONCLUSIONS:

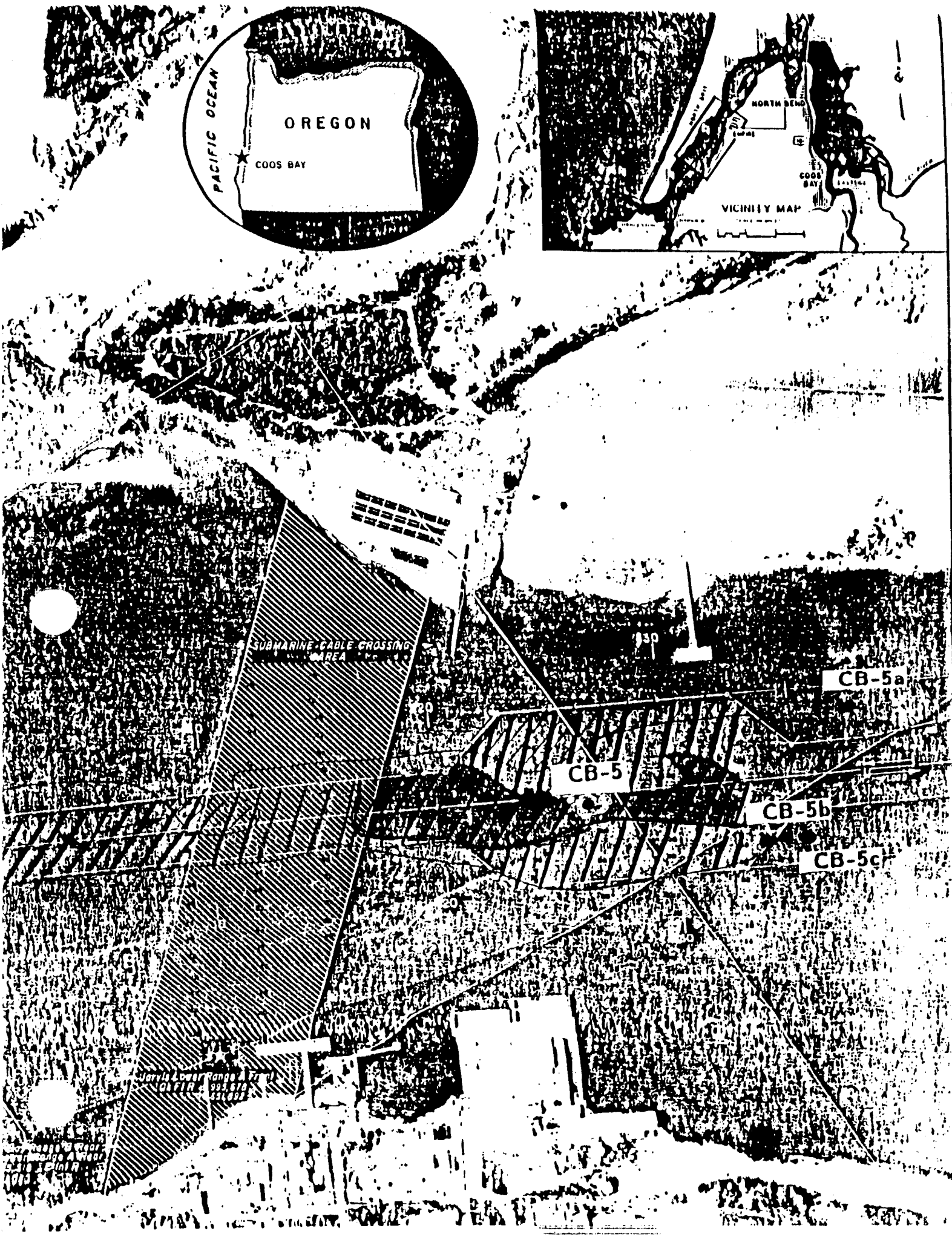
3. The sediments were mostly medium grain sized sands (80-99.9% sand) with low volatile solids content - 0.4 to 4.4%. Percent fines ranged from 0.1 to 20.0%. All physical measurements were below CENPP Tier I levels of concern. TIER II Chemical analysis revealed that none of the chemicals measured exceeded concern levels. The concentrations of Heavy metals, ammonia, TOC and oil and grease were typical of uncontaminated coastal and estuarine sediment. Pesticides, PCBs, PAHs and phenols were below the detection limits.

4. The concentration of dioxin/furans in sediment sample CB-5C was very low. The highly toxic 2,3,7,8-TCDD was not detected. Only 3 of the 17 dioxin/furan congeners tested were detected (see attachment 2). These were dioxin/furans with 6 or more chlorine atoms - a group which is considered to have much lower toxicity relative to the highly toxic 2,3,7,8-TCDD. The percent recoveries were very good for the internal standards used in quality assurance. Most recoveries were in the range of 62-90% The detection limit for 2,3,7,8-TCDD was 2.5 ng/kg a figure somewhat higher than the preferred 1.0 ng/kg.

5. A way to express the toxicity of a mixture of dioxin/furans is to relate it to the toxicity of 2,3,7,8-TCDD. This is done by multiplying each congener's concentration by its 2,3,7,8-TCDD toxic equivalency factor (TEF) and then summing for all

congeners. The result is a 2,3,7,8-TCDD toxic equivalency concentration (TEC). For sample CB-5C the total 2,3,7,8-TCDD TEC was 0.0058 ng/kg - a very low figure.

6. The sediments in the proposed repositioned Empire turning basin are typical of uncontaminated estuarian areas and are appropriate for unconfined in-water disposal according to CENPP TIERED TESTING sediment quality evaluation.


PACIFIC OCEAN
OREGON
COOS BAY
VICINITY MAP
NORTH BEND
COOS BAY
SUBMARINE CABLE CROSSING AREA
CB-5a
CB-5
CB-5b
CB-5c

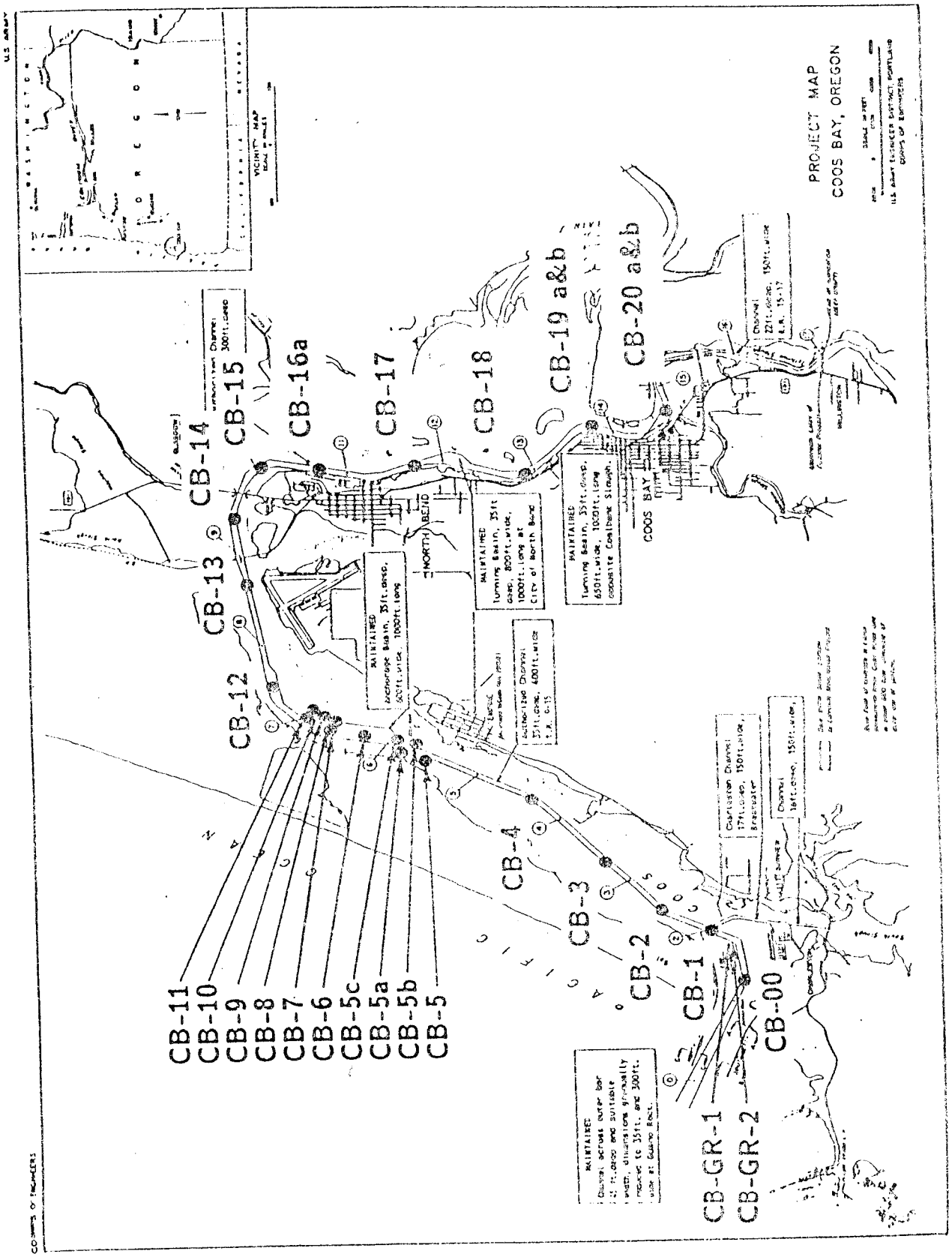


Figure 1

Coos Bay Navigation Project

SEDIMENT SAMPLE LOCATIONS, MAY 1989

PHYSICAL GRAIN SIZE

Battelle
Pacific Northwest Division
Marine Sciences Laboratory
439 West Sequim Bay Road
Sequim, Washington 98382
(206) 683-4151

April 16, 1990

Mr. Mark Siipola
U.S. Army Corps of Engineers
P.O. Box 2946, Attn: PL-AP
Portland, Oregon 97208

Dear Mark:

=CB 5C on map of Empire turning Basin

Recently Pacific Northwest Laboratory (Battelle-Northwest) conducted chemical analyses of sediment composite CB5 A+B and sediment sample CB 20A from the Portland District dredging project (Coos Bay) collected by your organization. Battelle received, in good condition, on May 27, 1989, sediment samples from the COE. Chemical results for most of these samples were reported September 15, 1989. Since then, sediment sample CB5 A+B has been analyzed for metals (Ag, As, Cd, Cr, Cu, Pb, Hg, Ni, and Zn), ammonia, oil and grease, TOC, pesticides, PCBs, PAHs, phenols, and dioxins. Sample CB 20A has been analyzed for dioxins.

Metal - By U.S. EPA (1986) Method 3050, which includes acid digestion followed by atomic absorption.

Oil and Grease - By Standard Methods 502 (1975), which includes solvent extraction and quantification by infrared spectrophotometry.

Ammonia - By Standard Methods 417 (1975), which includes distillation and titration.

TOC - By Standard Methods 502 (1975), which includes combustion of sediment and quantification by infrared absorption.

Pesticides and PCBs - By U.S. EPA (1986) Method 8080, which includes solvent extraction and quantification by GC-ECD.

PAH - By U.S. EPA (1986) Method 8100, which includes solvent extraction and quantification by GC-FID.

Phenols - By U.S. EPA (1986) Method 8040, which includes solvent extraction and quantification by GC-FID.

Dioxins - By U.S. EPA (1987) Method 8290, which includes solvent extraction and quantification by high resolution GC/MS.

For quality control (QC), surrogates were added to the sediments analyzed for organic compounds. The surrogate recoveries ranged from 75% to 104%. Recoveries were usually in the range of 31% to 112%.

Dioxin internal standards were in the range of 28% to 90% with only one standard outside the recommended range of 40% to 120%.

The chemical results in the enclosed tables indicate metals, ammonia, TOC, and oil and grease concentrations are low and typical for uncontaminated coastal and estuarine sediment. The concentrations of pesticides, PCBs, PAHs, and phenols are below the method detection limits. Only dioxin and furans with six or more chlorines were detected and the total 2378-TCDD equivalencies are very low, less than 0.03.

If I can be of additional assistance to your organization, please call me at 206/683-4151.

Sincerely,

Eric A. Crecelius
Senior Research Scientist

:at

Enclosures

Concentrations of Metals, Ammonia, Oil and Grease and Total Organic Carbon in Coos Bay Sediment (May, 1989)

CB-5C

(mg/kg dry weight)

Parameter	CB-5 A & B	CB-16 A	CB-17	CB-18	CB-19 A & B	CB-20 A & B
Ag	< 0.02	0.019	0.021	0.090	0.121	0.144
As	3.6	6.4	3.0	10.9	7.3	11.4
Cd	0.10	0.032	0.028	0.21	0.28	0.44
Cr	9.1	12.5	11.0	55.8	55.4	66.7
Cu	2.3	3.0	1.94	22.1	23.8	32.7
Pb	1.3	3.5	2.6	9.6	10.6	14.3
Hg	< 0.02	0.02	0.02	0.07	0.07	0.10
Ni	-	7.6	7.8	33.9	34.8	43.7
Zn	14.8	20.3	15.3	81.8	83.1	105
Oil and Grease	336	11.5	< 6.6	124	165	187
Ammonia	71	10.5	3.9	206	153	356
Total Organic Carbon	0.86%	0.36%	0.08%	2.70%	2.50%	2.76%

Sample No.: CB5A+CB5B Comp.

Lab Sample ID: 4323 A
Matrix: Soil
VTSR: 12/28/89

Date Extracted: 01/03/90
Date Analyzed: 01/19/90
Conc/Dil Factor: 1:20
Dry Weight: 35.0 grams

QC Report No.: 4323 - Battelle
Project: BOA37 Batch 4
110135

Data Release Authorized: _____
DATA PREPARED: MAC C.P.G (01/24/90)

GPC Cleanup: Yes
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	3.0 U
319-85-7	Beta-BHC	3.0 U
319-86-8	Delta-BHC	5.0 U
58-89-9	Gamma-BHC (Lindane)	3.0 U
76-44-8	Heptachlor	3.0 U
309-00-2	Aldrin	3.0 U
1024-57-3	Heptachlor Epoxide	3.0 U
959-98-8	Endosulfan I	3.0 U
60-57-1	Dieldrin	3.0 U
72-55-9	4,4'-DDE	6.0 U
72-20-8	Endrin	6.0 U
33212-65-9	Endosulfan II	6.0 U
72-54-8	4,4'-DDD	6.0 U
1031-07-8	Endosulfan Sulfate	12 U
50-29-3	4,4'-DDT	6.0 U
72-43-5	Methoxychlor	12 U
53494-70-5	Endrin Ketone	9.0 U
5103-74-2	Gamma Chlordane	5.0 U
5103-71-9	Alpha Chlordane	5.0 U
8001-35-2	Toxaphene	450 U
-	Aroclor-1242/1016	60 U
12672-29-6	Aroclor-1248	60 U
11097-69-1	Aroclor-1254	60 U
11096-82-5	Aroclor-1260	60 U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	**104%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.

ORGANICS ANALYSIS DATA SHEET- PNA by GC-FID

Lab Sample ID: 4323 A
Matrix: Soil

Sample No: CB5A & CB5B Comp.
QC Report No: 4323 - Battelle
VTSR: 12/28/89

Date Extracted: 01/03/90
Date Analyzed: 01/09/90
Conc/Dil Factor: 1:2
Dry Weight: 35.0 g.

GPC clean-up: Yes

Data Release Authorized: _____

REPORT PREPARED: MAC:O - C.G.. (01/19/90)

Reported in ppb(µg/kg)

CAS Number		µg/kg
91-20-3	Naphthalene	75 U
208-96-8	Acenaphthylene	75 U
83-32-9	Acenaphthene	75 U
86-73-7	Fluorene	75 U
85-01-8	Phenanthrene	75 U
120-12-7	Anthracene	75 U
206-44-0	Fluoranthene	75 U
129-00-0	Pyrene	75 U
56-55-3	Benzo(a)Anthracene	75 U
218-01-9	Chrysene	75 U
205-99-2 207-08-9	Benzo(b)Fluoranthene & Benzo(k)Fluoranthene	100 U
50-32-8	Benzo(a)Pyrene	200 U
193-39-5	Indeno(1,2,3-cd)Pyrene	300 U
53-70-3	Dibenz(a,h)Anthracene	300 U
191-24-2	Benzo(ghi)Perylene	300 U

SURROGATE PERCENT RECOVERY	
Terphenyl	103%

Data Qualifiers

U — Indicates compound was analyzed for but not detected at the given detection limit.

NA — Indicates compound not analyzed.

NR — Indicates compound not reported due to dilution and/or matrix interference.

ORGANICS ANALYSIS DATA SHEET
Phenols/Guaiacols by GC/FID Analysis

QC Report: 4323 - Battelle
Project: BOA37 Batch 4 11013[illegible]

Matrix: Soil

Date Received: 12/28/89

Data Release Authorized

Report prepared: 01/22/90 - MAC:C C.P.G.

Acid Cleaned: No
Alumina Cleaned: No
GPC Cleaned: Yes

Reported in ppb (µg/Kg)

Sample #:	Method Blk.	CB5A + CB5B Comp.
ARI Lab ID:	*0104 MB*	*4323 A*
Date Extracted:	*01/04/90*	*01/04/90*
Date Analyzed:	*01/11/90*	*01/11/90*
Dry Weight:	*35.0 g*	*36.2 g*
Dilution:	*1:2*	*1:2*
Phenol	100 U	100 U
2-Chlorophenol	150 U	150 U
2-Methylphenol	100 U	100 U
4-Methylphenol	100 U	100 U
2-Nitrophenol	150 U	150 U
2,4-Dimethylphenol	100 U	100 U
2,4-Dichlorophenol	170 U	170 U
4-Chloro,3-Methylphenol	120 U	120 U
2,4,6-Trichlorophenol	180 U	180 U
2,4,5-Trichlorophenol	230 U	230 U
Guaiacol	120 U	120 U
3,4,5-Trichloro Guaiacol	230 U	230 U
4,5,6-TrichloroGuaiacol	140 U	700 U
TertrachloroGuaiacol	210 U	210 U
*Surrogate %Rec**	*46%*	*75%*

* *Surrogate is 4-ChloroGuaiacol*

Data Reporting Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.

NR Indicates compound not reported due to chromatographic interference and/or dilution.

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE.15

Sample ID (Client's#)....CB5A & CB5B
Sample ID (TCT#).....169529
Analysis Date.....1-11-90
Filename.....S00111K
Analyst.....BB
Sample Amount.....0.0092 kg
ICAL Date.....9/26/89
CCAL Filename.....S00111A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg
2378-TCDF	nd	1.10
TOTAL TCDF	nd	-----
2378-TCDD	nd	2.50
TOTAL TCDD	nd	-----
12378-PeCDF	nd	0.68
23478-PeCDF	nd	0.52
TOTAL PeCDF	nd	-----
12378-PeCDD	nd	0.78
TOTAL PeCDD	nd	-----
23478-HxCDF	nd	0.62
123678-HxCDF	nd	0.25
123789-HxCDF	nd	0.67
234678-HxCDF	nd	0.77
TOTAL HxCDF	nd	-----
123478-HxCDD	nd	1.10
123678-HxCDD	nd	0.49
123789-HxCDD	nd	0.73
TOTAL HxCDD	nd	-----
1234678-HpCDF	nd	1.40
1234789-HpCDF	nd	0.85
TOTAL HpCDF	3.30	-----
1234678-HpCDD	5.70	-----
TOTAL HpCDD	13.00	-----
OCDF	3.50	-----
OCDD	66.00	-----

INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF-C13....	2.00	73
2378-TCDD-C13....	2.00	75
12378-PeCDF-C13..	2.00	77
23478-PeCDF-C13..	2.00	80
12378-PeCDD-C13..	2.00	91
123478-HxCDF-C13.	2.00	62
123678-HxCDF-C13.	2.00	68
123789-HxCDF-C13.	2.00	69
234678-HxCDF-C13.	2.00	75
123478-HxCDD-C13.	2.00	67
123678-HxCDD-C13.	2.00	75
1234678-HpCDF-C13	2.00	28
1234789-HpCDF-C13	2.00	90
1234678-HpCDD-C13	2.00	85
OCDD-C13.....	4.00	89
1234-TCDD-C13....	2.00	na
123789-HxCDD-C13.	2.00	na
2378-TCDD-C137...	0.80	78

Total 2378-TCDD Equivalence = 0.0058
(Using EPA 8290 Factors)

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-2037

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE.15

Sample ID (Client's#)....CB20A
Sample ID (TCT#).....169527
Analysis Date.....1-11-90
Filename.....S00111J
Analyst.....BB
Sample Amount.....0.0095 kg
ICAL Date.....9/26/89
CCAL Filename.....S00111A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg
2378-TCDF	nd	0.99
TOTAL TCDF	nd	-----
2378-TCDD	nd	1.90
TOTAL TCDD	nd	-----
12378-PeCDF	nd	0.55
23478-PeCDF	nd	0.67
TOTAL PeCDF	nd	-----
12378-PeCDD	nd	0.45
TOTAL PeCDD	nd	-----
123478-HxCDF	nd	0.68
123678-HxCDF	nd	0.34
123789-HxCDF	nd	0.46
234678-HxCDF	nd	0.71
TOTAL HxCDF	nd	-----
123478-HxCDD	nd	0.48
123678-HxCDD	nd	0.77
123789-HxCDD	nd	0.68
TOTAL HxCDD	3.5	-----
1234678-HpCDF	nd	0.74
1234789-HpCDF	6.5	-----
TOTAL HpCDF	6.5	-----
1234678-HpCDD	14.0	-----
TOTAL HpCDD	35.0	-----
OCDF	8.7	-----
OCDD	130.0	-----

INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF-C13....	2.00	81
2378-TCDD-C13....	2.00	83
12378-PeCDF-C13..	2.00	90
23478-PeCDF-C13..	2.00	90
12378-PeCDD-C13..	2.00	94
123478-HxCDF-C13.	2.00	69
123678-HxCDF-C13.	2.00	67
123789-HxCDF-C13.	2.00	73
234678-HxCDF-C13.	2.00	78
123478-HxCDD-C13.	2.00	82
123678-HxCDD-C13.	2.00	71
1234678-HpCDF-C13	2.00	64
1234789-HpCDF-C13	2.00	77
1234678-HpCDD-C13	2.00	80
OCDD-C13.....	4.00	90
1234-TCDD-C13....	2.00	na
123789-HxCDD-C13.	2.00	na
2378-TCDD-C137...	0.80	79

Total 2378-TCDD Equivalence = 0.0221
(Using EPA 8290 Factors)

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-2037

* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

COOS BAY ESTUARY (89-SHM-716)

Boring: --- Sample: CB-5 Depth: --- Lab No.: 71617

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	7.70	99.5
No. 5	14.70	99.0
No. 10	30.00	98.0
Pan	1504.90	0.0
No. 18	3.20	93.9
No. 35	16.50	76.8
No. 60	60.60	20.2
No. 120	75.70	0.8
No. 230	76.10	0.3
Pan	76.30	0.0

No hydrometer analysis.

D85: 0.62 D60: 0.41 D50: 0.36 D30: 0.28 D15: 0.22 D10: 0.19 mm

Cu: 2.09 Cc: 1.00

Gravel: 0.9% Sand: 98.7% Fines: 0.4%

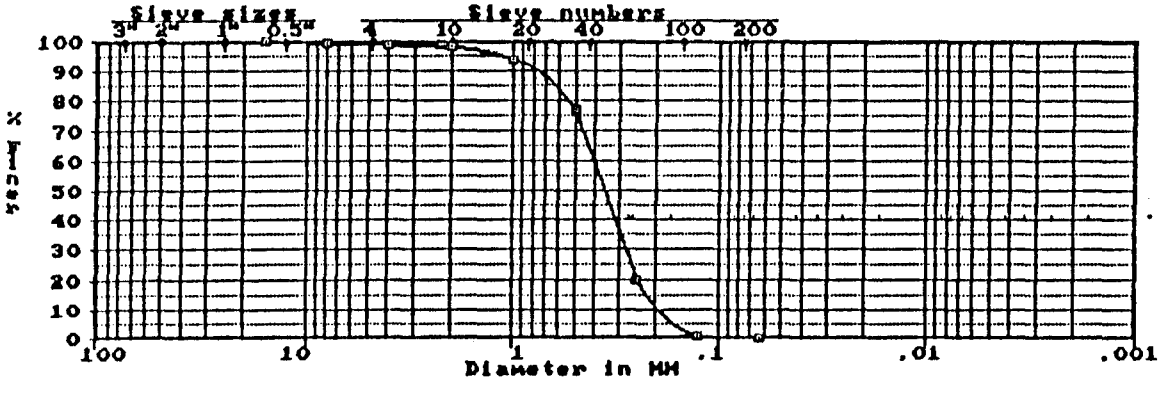
---------- ASTM D 2487 Classification ----------

SP Poorly graded SAND

---------- Comments ----------

SAMPLED ON 22 MAY 89

SAMPLE WAS 76% SHELL FRAGMENTS



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

COOS BAY ESTUARY (89-SHM-716)

Boring: --- Sample: CB-5A Depth: --- Lab No.: 71618

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	228.20	0.0
No. 18	0.70	99.7
No. 35	25.30	88.9
No. 60	194.30	14.9
No. 120	227.40	0.4
No. 230	228.10	0.0
Pan	228.20	0.0

No hydrometer analysis.

D85: 0.48 D60: 0.38 D50: 0.35 D30: 0.29 D15: 0.25 D10: 0.20 mm

Cu: 1.92 Cc: 1.10

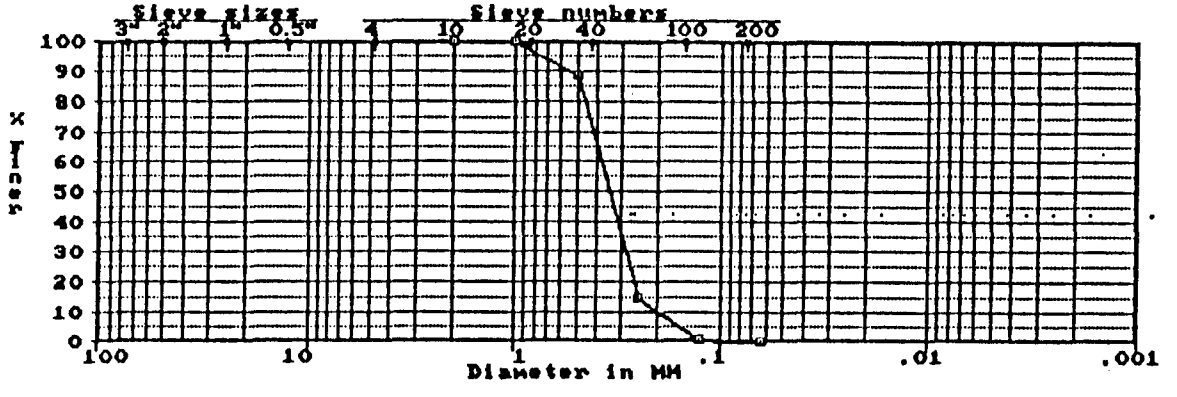
Gravel: 0.0% Sand: 99.9% Fines: 0.1%

---------- ASTM D 2487 Classification ----------

SP Poorly graded SAND

---------- Comments ----------

- VOLATILE SOLIDS = 0.5%
- SAMPLED ON 22 MAY 89



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

COOS BAY ESTUARY (89-SHM-716)

Boring: --- Sample: CB-5B Depth: --- Lab No.: 71619

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	121.90	0.0
No. 18	2.40	98.0
No. 35	5.70	95.3
No. 60	30.20	75.2
No. 120	81.20	33.4
No. 230	99.80	18.1
Pan	121.90	0.0

Hydrometer Analysis

Sample Weight: 121.9 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	19.7	0.0484	16.4
3	20.0	15.2	0.0287	12.8
10	20.0	12.2	0.0160	10.3
100	20.0	8.7	0.0067	7.5
200	20.0	6.7	0.0048	5.8

D85: 0.32 D60: 0.20 D50: 0.17 D30: 0.11 D15: .040 D10: .014 mm

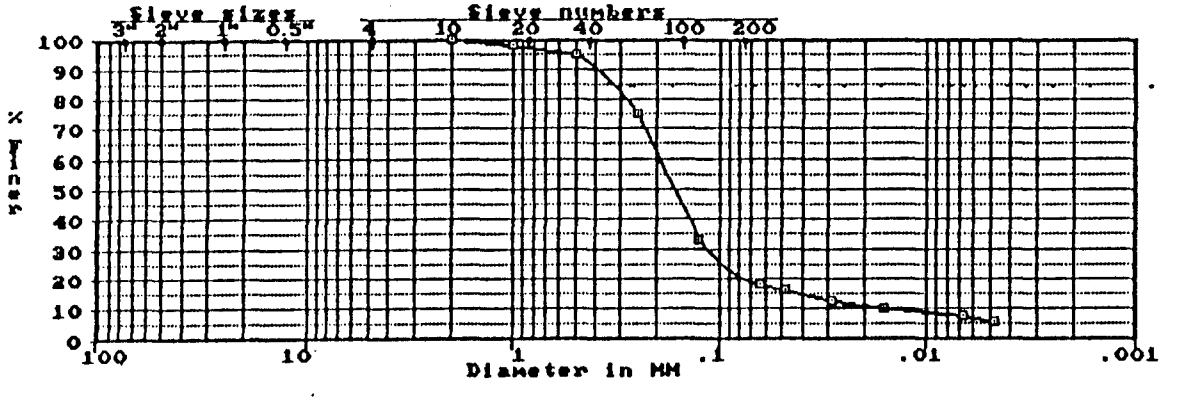
Cu: 13.5 Cc: 4.57

Gravel: 0.0% Sand: 80.0% Fines: 20.0%

Comments

- VOLATILE SOLIDS = 4.4%
- SAMPLED ON 22 MAY 89
- SAMPLE WAS 26% SHELL FRAGMENTS

Cannot classify soil without knowing type of fines.



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

COOS BAY ESTUARY (89-SHM-716)

Boring: --- Sample: CB-5C Depth: --- Lab No.: 71620

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	84.20	0.0
No. 18	1.90	97.7
No. 35	8.20	90.3
No. 60	54.30	35.5
No. 120	71.70	14.8
No. 230	76.20	9.5
Pan	84.20	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 84.2 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	7.0	0.0522	8.8
3	20.0	6.2	0.0302	7.9
10	20.0	5.2	0.0167	6.7
100	20.0	3.2	0.0069	4.4
200	20.0	2.7	0.0049	3.8

→ Chem sample jars were labled 5A & 5B. Siipola 4/3/90

D85: 0.47 D60: 0.34 D50: 0.30 D30: 0.22 D15: 0.13 D10: .076 mm

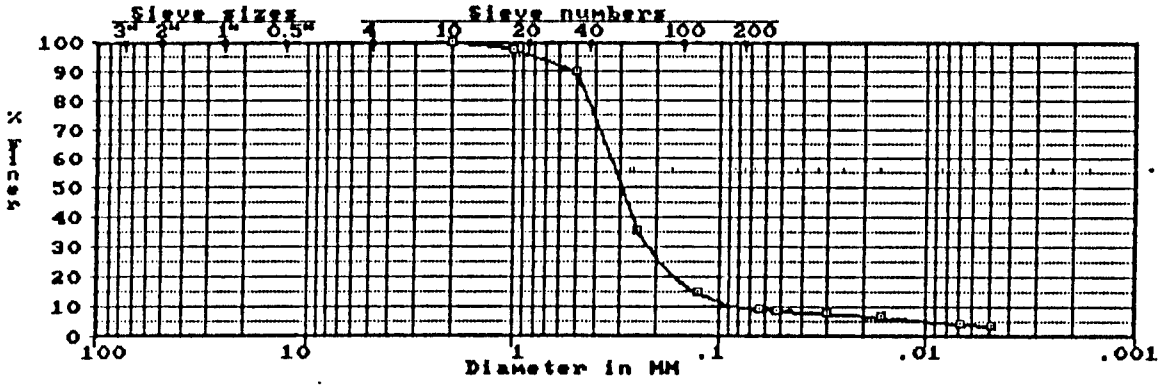
Cu: 4.43 Cc: 1.90

Gravel: 0.0% Sand: 90.1% Fines: 9.9%

---------- Comments ----------

- VOLATILE SOLIDS = 1.5%
- SAMPLED ON 22 MAY 89
- SAMPLE WAS 88% SHELL FRAGMENTS

Cannot classify soil without knowing type of fines.



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

COOS BAY ESTUARY (89-SHM-716)

Boring: --- Sample: CB-6 Depth: --- Lab No.: 71621

----- Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	180.70	0.0
No. 18	0.80	99.6
No. 35	11.40	93.7
No. 60	98.60	45.4
No. 120	180.00	0.4
No. 230	180.30	0.2
Pan	180.70	0.0

No hydrometer analysis.

D85: 0.43 D60: 0.30 D50: 0.26 D30: 0.20 D15: 0.16 D10: 0.15 mm

Cu: 2.00 Cc: 0.93

Gravel: 0.0% Sand: 99.7% Fines: 0.3%

---------- ASTM D 2487 Classification ----------

SP Poorly graded SAND

---------- Comments ----------

- VOLATILE SOLIDS = 0.4%
  SAMPLED ON 22 MAY 89